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Relationship of Calendar Days and Growing Degree Days to Corn Maturity from Various Kernel Growth Stages

by Robert Hall, Extension agronomist-crops

Weather in recent years has caused many corn seeding delays or replanting after a killing spring frost. Corn growers often inquire about how long it will take corn to reach maturity from a given growth stage. Iowa research results (Table 1) show how many calendar days or GDDs are needed for a typical hybrid to reach maturity from a given growth stage.

Use caution when applying the calendar days and heat unit days shown in Table 1 to your crop conditions. Wisconsin research indicates the number of GDDs needed to reach maturity from a given stage may vary depending on such factors as seeding date and depth, amount of crop residues present, soil moisture, soil texture, and seedbed conditions during and immediately

Table 1. Relationship between kernel growth stage and corn maturity in terms of calendar days and growing degree days (GDD's).

Kernel Growth Stage	Days to Maturity		Percent Maximum Yield		Percent Moisture Content	
	Calendar	GDD's	Grain	Whole Plant	Grain	Whole Plant
Silk	50 - 55	1100 - 1200	0	50 - 55	—	80 - 85
Blister	40 - 45	875 - 977	0 - 10	55 - 60	85 - 95	80 - 85
Late Milk - Dough	30 - 35	650 - 750	30 - 50	65 - 75	60 - 80	75 - 80
Early Dent	20 - 25	425 - 525	60 - 75	75 - 85	50 - 55	70 - 75
Full Dent	10 - 15	200 - 300	90 - 95	100	35 - 40	65 - 70
Physiologically Mature - Maximum Dry Matter Production	0	0	100	95 - 100	25 - 35	55 - 65
GDD changes for all values at or following seeding due to:		add (+) or subtract (-)				
Seeding after mid-May		- 50 to 70				
For each 1" seeding depth > 2"		+ 15				
Soil moisture below optimum		+ 30				
More than 75% crop residue		+ 30 to 60				
Very fine soils		+ 30 to 60				
Very coarse soils		- 30 to 60				
Soil crusting or large clods		+ 30				

Source: Adapted from Hanway, J.J. 1966. *How a corn plant develops*. Iowa State University, Coop. Ext. Serv. Spec. Report No. 48, 17 p.; and Carter, P.R. 1991. *Corn development and growing degree days*. *Agronomy Advice Field Crops* 28.10, February, 5 p.

following seeding. For example, if seeding is delayed until May 17 subtract 50 GDDs from the totals listed in the GDD column. Likewise, if the seeding depth was 3 inches then add 15 GDDs to the values in the GDD column. Under such seeding conditions we need to subtract a total of 35 GDDs from each kernel growth stage. In other words the GDD totals would be 1065 - 1165 GDDs for silk, 800 - 942 GDDs for blister, 615 - 715 GDDs for late milk, 390 - 490 GDDs for early dent, and 165 - 265 GDDs for the full dent stage.

In addition, consider both current and future weather conditions in your assessment. For example, at full dent you need about 10-15 calendar days or about 200-300 GDDs to reach maturity. On average, South Dakota corn attains full maturity from about August 23 through October 1.

In some years, above average temperatures may cause corn to mature and dry down early, while in other years

below average temperatures during this period may delay maturity. For instance, if temperatures drop below 50 F. at night and only reach 80 F. during the day, only 15 heat units are generated per day. At this pace it would take about 13 days to attain 200 heat units and 20 days to attain 300 heat units. This is 3 to 5 days longer than what is indicated in Table 1. Therefore, consider both the short- and long- term weather forecasts when evaluating potential yield losses or high moisture as the time for the first killing frost approaches the end of the growing season.

In addition, Table 1 also shows how the dry matter and moisture contents of the whole plant and grain differs among growth stages. Note at full dent about 95% of the grain yield has accumulated, but the moisture content remains relatively high at 35 - 40%. Only at physiological maturity is maximum yield attained, but at a moisture content of about 25 - 35%. Even then, the grain still has to be dried to about 13% for long-term storage.

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